

REMARKS/ARGUMENTS

Claim Rejections - 35 U.S.C. 112

Claims 1-24, 26-29 stand rejected under 35 U.S.C. 112, second paragraph as being indefinite.

More specifically, the Examiner has rejected claim 1 as being vague and indefinite with respect to whether applicants are claiming a fuel cell or an electrochemical cell. Claim 1, and in a number of other claims as detailed below, have been amended so that they all now clearly claim an electrochemical cell. References to the "fuel cell" have now all been amended to refer to a "electrochemical cell."

The Examiner further argued that the electrochemical cell as now presented is "broader in scope than in the originally presented claim". It is acknowledged that reference to "an electrochemical cell assembly" does encompass cells other than a fuel cell, e.g. cells intended for use as electrolyzers. However, it is submitted that this amendment is completely permissible and does not amount to addition of new subject matter. The Examiner has referred to the comments in the previously submitted Response filed February 21, 2006, more specifically the comments on claim amendments commencing in the middle of page 17. There it is noted that the application as a whole and the original claims anticipated application of the invention to fuel cells as a class of electrochemical cells and electrochemical cells generally. Original claim 30 was directed to a method of forming a seal in electrochemical cell assembly. Thus the statement in the first three lines of paragraph [0031] of the specification state that "in addition to its applicability to fuel cells, the present invention is generally applicable to electrochemical cells."

The Examiner is also referred to MPEP 2163.06. There, it is noted that:
"stated another way, information contained in any one of the specification, claims or drawings of the application as filed may be added to any other part of the application without introducing new matter."

Thus, it is submitted that this amendment to the claims to refer generally to electrochemical cells is fully permissible and is fully in compliance with 35 U.S.C. 132.

The Examiner had argued that claims 7, 10, 11, 13-15, 19-22 and 24 lack antecedent basis for various phrases, including the word "fuel", and also for the phrase "said stack". All of these claims, except for claims 11 and 21, have been amended so as to consistently use the term "electrochemical". The word "stack" has been replaced by "assembly". As to claims 11 and 21, it is submitted that no amendment is necessary in this respect for these two claims.

For claim 11, the Examiner argued that it lacked antecedent basis for "the membrane exchange assembly". The last line in this claim has been amended to refer to "the membrane electrode assembly".

The Examiner also argued that claim 11 is vague and indefinite with respect as to what the applicant is attempting to claim. The claim has been amended by introduction to the word "including", following its usage in other claims, to make it clear that the "membrane electrode assembly" includes the proton exchange membrane and gas diffusion media on both sides of that membrane. It is therefore submitted that this claim is wholly clear and definite. Similar comments apply with respect to the Examiner's rejection of claim 12.

Claim Amendments

Before turning to the rejection of the claims under 35 U.S.C. 103, review is provided of the amendments now being entered to the claims. All amendments are being entered without prejudice. Applicant's reserve the option to further prosecute the same or similar claims in the instant or subsequent patent application.

Claim 1 is being amended to specify that the plurality of separate elements includes "a plurality of plates". As detailed in the description, the invention is applicable to an electrochemical cell structure comprising a plurality of plates stacked together, with the necessary MEA assemblies between them.

Then, to define the groove network further, it is specified, in step (b), that the method provides "at least one plate with a connection aperture". Further, the

groove network is then specified as extending "between the separate elements and through each connection aperture".

As is detailed further below, the intent is to have characteristics in the invention that enable more sophisticated and complex groove networks to be provided in a complex electrochemical cell assembly. For example, such a cell assembly can comprise hundreds of individual cells, each requiring a number of separate and complex groove network portions. The intent is for these to be connected by apertures extending through the individual plates.

In independent claim 9, a similar amendment has been entered. Thus, claim 9 includes "at least one connection aperture" provided "in one of the plurality of separate elements". The groove network is then again specified as extending between the plurality of separate elements and through each connection aperture.

Clarifying amendments being entered to claims 13 and 14.

In independent claim 30, this claim is being amended to specify that at least one element includes at least one connection aperture for the groove network. Again, the arrangement of the groove network is defined similarly to the other two independent claims.

Claim Rejections – 35 U.S.C. 103

Claims 1-4, 6, 8-10, 23, 27, 28 and 30-32 stand rejected under 35 U.S.C. 103(a) as being unpatentable under Sasaki et al. in view of Lifferth.

The Examiner relied upon Sasaki et al. for disclosing a large number of features, many of which seem to have little or no relevance to the present invention as claimed.

Fundamentally, Sasaki et al. is an injection molding technique for molding a gasket to a carbon plate. As such, apart from the details of the gasket etc., the teaching is largely conventional. It merely teaches the injection molding of gaskets onto a plate for a fuel cell, with the clear and express teaching being that the gasket for each plate should be molded separately and individually. There is simply no teaching or suggestion that gaskets for two or more plates, could somehow, be molded together. At

most, what this patent teaches it that one can have a gasket that extends through a plate so as to project on either side of the plate.

One can also note that the statement that occurs in many places throughout the specification and even in the claims that the invention is for a gasket for "layer-built fuel cells". Thus, the clear teaching is that this invention is applicable, and only applicable, to fuel cells that are assembled by the entirely conventional technique of assembling individual elements in a stack or "layer-built", with the stack then being clamped together. One can note that the description in column 2, lines 19-30. There is reference to problems of displacement and "uneven pressure in sheets of electrodes". The final sentence to this paragraph is: "There have also been a big problem concerning processability in stacking each sheet to its correct position". Thus, the sole, clear and consistent teaching of Sasaki et al. '120 is that, at most, gaskets can be molded to individual plates, but that then the plates and intervening membranes need to be assembled or stacked together before finally being held together in a stack.

The Examiner correctly identifies that two molds are placed together in a face-to-face relationship to mold the gaskets. In contrast, the present invention does not require any separate mold element, with the seal being formed and defined entirely by the groove network within the elements of the stack itself.

While Sasaki et al. may disclose a configuration in which a gasket can be formed on both sides of a plate, and it can be noted that this is solely in the context of providing a gasket on a single element or plate for the "layer-built fuel cell". There is no teaching or suggestion as to how this technique could be extended to provide a gasket on more than one plate; rather, the teaching is exactly the opposite that gaskets for each plate need and should be formed separately.

The Examiner correctly notes that the sealing material is an elastic material. The material's sufficient elasticity is essential in such a conventional gasket, since when the elements are assembled together it is this elasticity that is required to accommodate variations in thickness, alignment, etc.

The Examiner correctly notes that "Sasaki et al. does not disclose assembling the fuel cell before filling the at least one groove network".

The Examiner then turns to the Lifferth patent for disclosing a seal made of one or more formed sealant receiving grooves with a fitting for injecting a liquid sealant material.

It is submitted that to establish a *prima facie* case of obviousness, it is essential to find some motivation or suggestion to make the claimed invention in the prior art teachings (MPEP 2144.08).

Here, given that the teaching of Sasaki et al. is completely contrary to the present invention, it is submitted that there is simply no reason or basis for the proposed modification, and that any such modification would, in effect, destroy the function of Sasaki et al. Sasaki et al. teach that one should mold separately the gaskets for each sheet or element of a fuel cell, so that the gaskets are resilient and project beyond the configuration they will adopt in use; in use and when assembled, in known manner, the gaskets resiliently deform so as to maintain sufficient pressure to form the seals. This technique is thus conventional and wholly different from that taught in Lifferth et al.

Lifferth is not even concerned with fuel cell technology, and primarily is concerned with seals around pipes, a different field with differing sealing issues and different sealing configurations. The teaching of Lifferth is sparse and brief. The primary teaching is that a liquid or fluent material should be injected into spaces between two mating parts, the drawings showing pipe connections, to form a seal. The primary teaching is that the sealant material should be liquid and should be maintained in a liquid form. There was one brief mention that the material can "harden to the extent necessary, to keep from being forced out of the grooves". There is no express teaching of the sealant material being caused to "set", in the manner required by the present invention. It is thus submitted that on this ground alone, the combination of Sasaki et al. and Lifferth fail to teach all the claimed features of the invention.

As detailed above, the claims have been further amended to require that there be at least one "connection aperture" connecting different portions of the groove network together within the cell assembly. Such a feature is nowhere found in Lifferth. Lifferth is concerned with simple structures having a few elements, and the only teaching is that the sealant flow between mating faces of the different elements. There

is no teaching of anything amounting to a connection aperture to enable a sealant material to flow from one side of one element to the other. Accordingly, for this reason it is further submitted that the combination of Lifferth and Sasaki et al. fail to teach all the elements of the invention as now claimed.

The Examiner makes reference to Sasaki et al. for disclosing that a seal may be made by injection molding under reduced pressure, without any adverse effects to the bonding strength between the grooves and the carbon plate. The relevance of this statement is not clear.

The Examiner then further states that ""even though Lifferth deals with injection molding of liquid rubber between parts of a flange and a groove of a pipe, Lifferth discloses that it is known in the art of injection molding.....". Lifferth is not concerned with "injection molding" in the conventionally understood sense. "Injection molding" is a reference to injecting material into a mold and then having the material set to form a solid, molded object, which subsequently removed from the mold. All Lifferth teaches is the injection of a liquid sealant, to form some sort of seal, with one, imprecise reference to the liquid being caused merely to "harden" to the extent necessary to keep it from being forced out of the grooves. Rather, the overall teaching of Lifferth seems to be to maintain the sealant in a predominantly liquid state. One can note the statement at column 3, lines 9-12 that "the sealant totally encircles the conduit 32 and will provide seals between the conduits 30 and 31 and conduit 32 even if the enlarged ends 30A and 31A are moved with respect to the conduit 32." The teaching seems to be that maintaining the sealant in liquid form is necessary, to accommodate accidental movement between the various elements, as presumably is common with pipe fittings.

The Examiner then further argued that, since Lifferth dealt with "injection molding", and uses similar liquid rubber as in Sasaki et al. that "one having ordinary skill in the art would have the motivation to use such material in the sealing by injection mold [sic] of a seal material into an assembled fuel cell, since Sasaki et al. discloses that reduced pressures are used to obtain good bond strength between the groove and the carbon plate (separator)." This whole statement misrepresents the prior art in numerous ways. In Lifferth, there is no mention of "injection molding" or "liquid rubber". Again, this

whole theoretical combination destroys the basic function of Sasaki et al., that is to provide plates with individually molded seals. It is therefore submitted that there is no motivation, suggestion or teaching in this art to make such a combination.

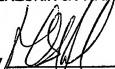
As detailed above with respect to the amended claims, a fuel cell assembly presents a much more complex structure than the simple pipe seals disclosed in Lifferth. Accordingly, it is submitted that there would be no motivation to combine these references in the manner argued by the Examiner. Any such combination does not disclose all the features of the invention as now claimed. Most significantly, with respect to the amended claims, there is no teaching in either of these references as to how the liquid sealant material could be directed to both sides of, for example, individual plates in the cell stack. This feature is now accommodated by the provision of a "connection aperture" in each plate as required.

Double Patenting

The Examiner had provisionally rejected the claims on the ground of obviousness-double patenting as being unpatentable over claim 11 of copending application no. 10/712,159. While this application has not yet issued to patent, it has been allowed, and accordingly, a Terminal Disclaimer statement is attached.

Respectfully submitted,

BERESKIN & PARR

By 

H. Samuel Frost
Reg. No. 31,696
Tel: 416-364-7311